



**Carnegie Mellon  
Software Engineering Institute**

Pittsburgh, PA 15213-3890

# **A PSP/TSP Approach to CMMI Transition**

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- Personal Software Process<sup>SM</sup>
- PSP<sup>SM</sup>
- Team Software Process<sup>SM</sup>
- TSP<sup>SM</sup>



# Rules of Engagement

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“CMM” means SW-CMM.

“CMMI” means CMMI-SE/SW.

“TSP” means the TSP and its recommended introduction strategy, including the prerequisite PSP training for management, engineers and relevant non-software personnel, except where PSP is explicitly addressed.



# Topics

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➡ Rationale for using TSP for CMMI transition

TSP and CMM

TSP and CMM/CMMI differences at levels 2 and 3

TSP and integrated engineering teams



# **CMM to CMMI Transition Scenario**

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Your organization is using CMM as a software engineering process standard.

You see some gaps between your current CMM practices and what you'll need to do when you move to CMMI.

You need a mechanism for bringing the wider engineering organization under the umbrella.

The TSP addresses each of these situations.



# TSP, CMM, and CMMI

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The original CMM goals have not changed with the CMMI.

- quality products
- on committed schedules
- for predictable costs

CMMI recognizes that these goals apply to the entire engineering life cycle, not just the software development life cycle.

PSP and TSP were designed to support CMM goals at the individual and team levels, respectively, and have been shown to work for more than “just” software development.

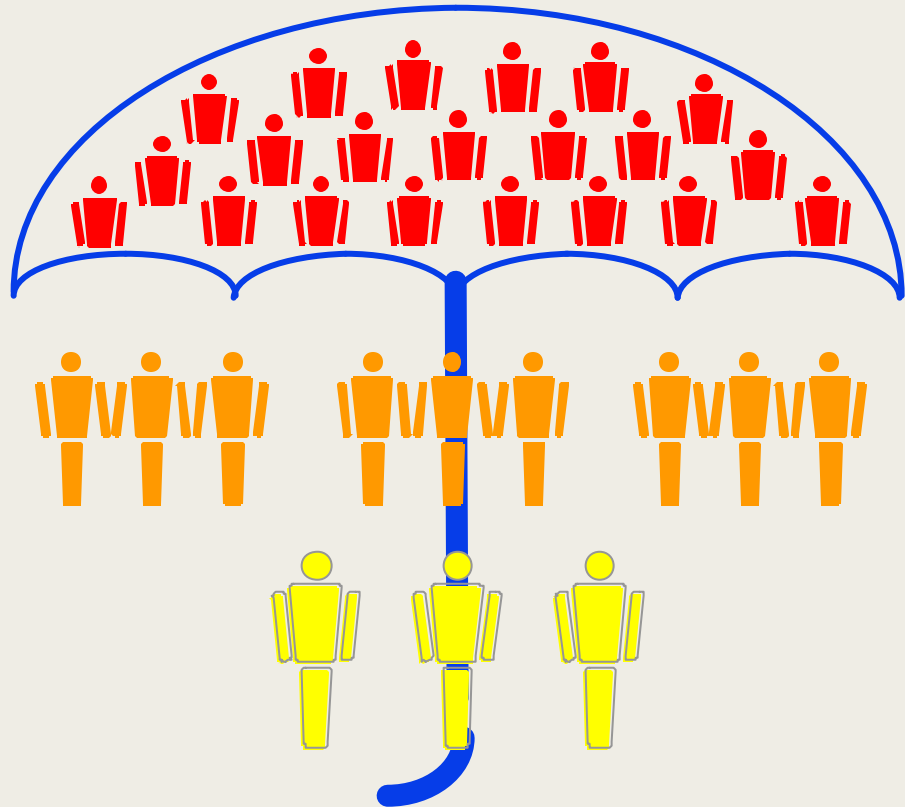


# Building Organizational Capability

**CMM/CMMI - for  
organizational  
capability**

**TSP - for quality  
products on cost  
and schedule**

**PSP - for  
individual skill  
and discipline**





# **TSP: Results Across CMM Levels**

<b>Category</b>	<b>Without TSP</b>	<b>With TSP</b>
<b>Average schedule deviation - range</b>	<b>27% to 112%</b>	<b>-8% to 5%</b>
<b>Average effort deviation - range</b>	<b>17% to 85%</b>	<b>-8% to -4%</b>
<b>Acceptance test product quality (defects/KLOC)</b>	<b>.1* to .7</b>	<b>.02 to .1</b>
<b>System test savings (cost to system test 1000 LOC)</b>	<b>1 to 5 days</b>	<b>.1 to 1 days</b>
<b>Number of post-release defects per KLOC</b>	<b>.2 to 1+</b>	<b>0 to .1</b>

\* This data (.1 defects/KLOC in acceptance test) is from a CMM level 5 organization.

Source organizations were CMM levels 1, 2, 3, and 5.





# Topics

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# CMM-TSP Gap Analysis -1

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The TSP initiative team at the SEI will soon publish results of a paper evaluation of TSP practices relative to SW-CMM v.1.1.

The evaluation was done in the form of a gap/overlap analysis, often performed as part of CMM-based improvement effort.

Major assumptions of the analysis were that

- the organization is following the recommended SEI introduction strategy
- all development teams are using the TSP



## CMM-TSP Gap Analysis -2

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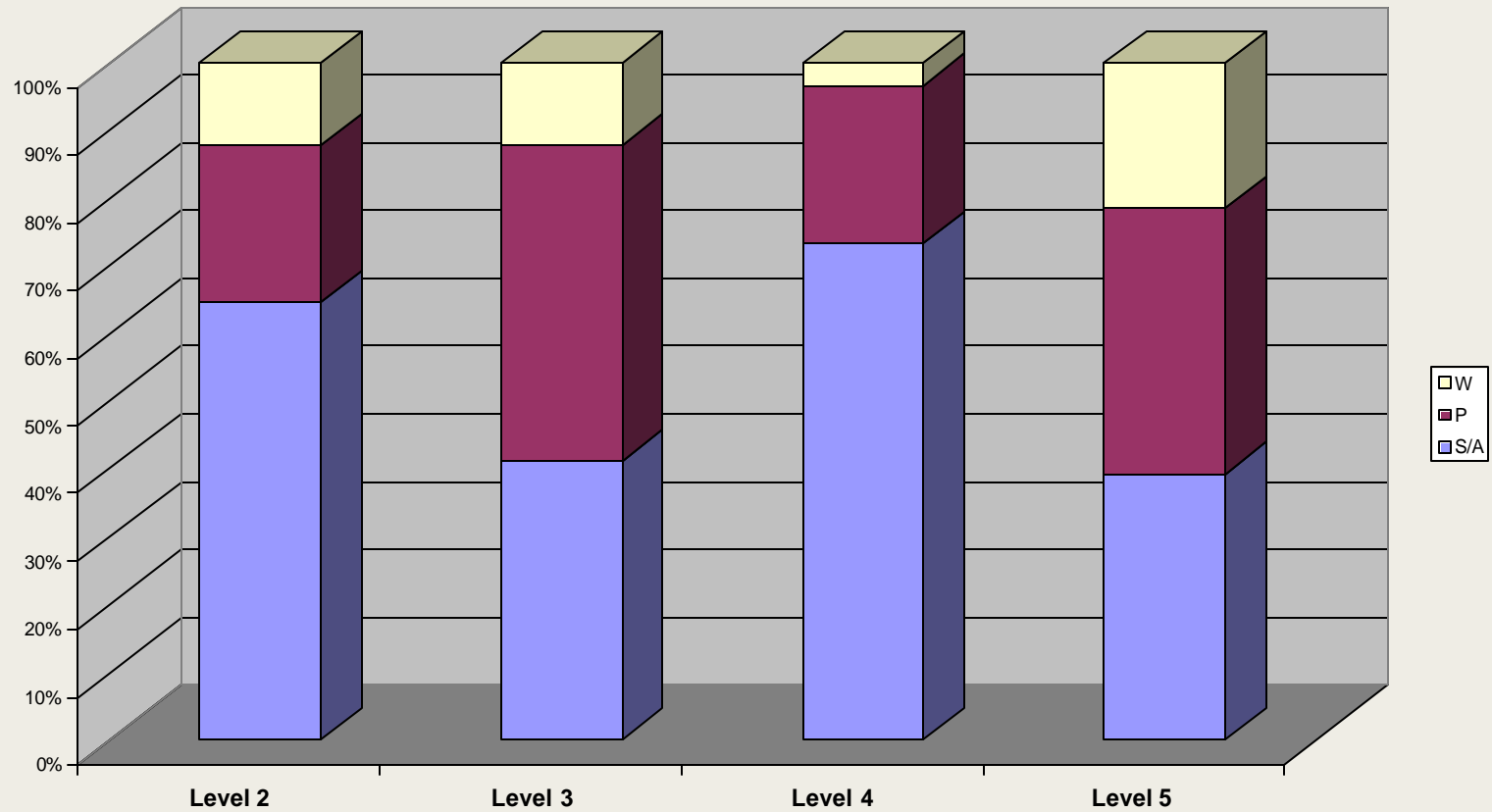
While this analysis was being performed, two SEI clients who were implementing TSP in their organizations also performed informal CMM gap analyses.

Another SEI client had a formal CMM assessment that included one TSP team. Two members of that assessment team have published observations related to TSP.

A similar evaluation of the TSP against the CMMI is planned for FY02.

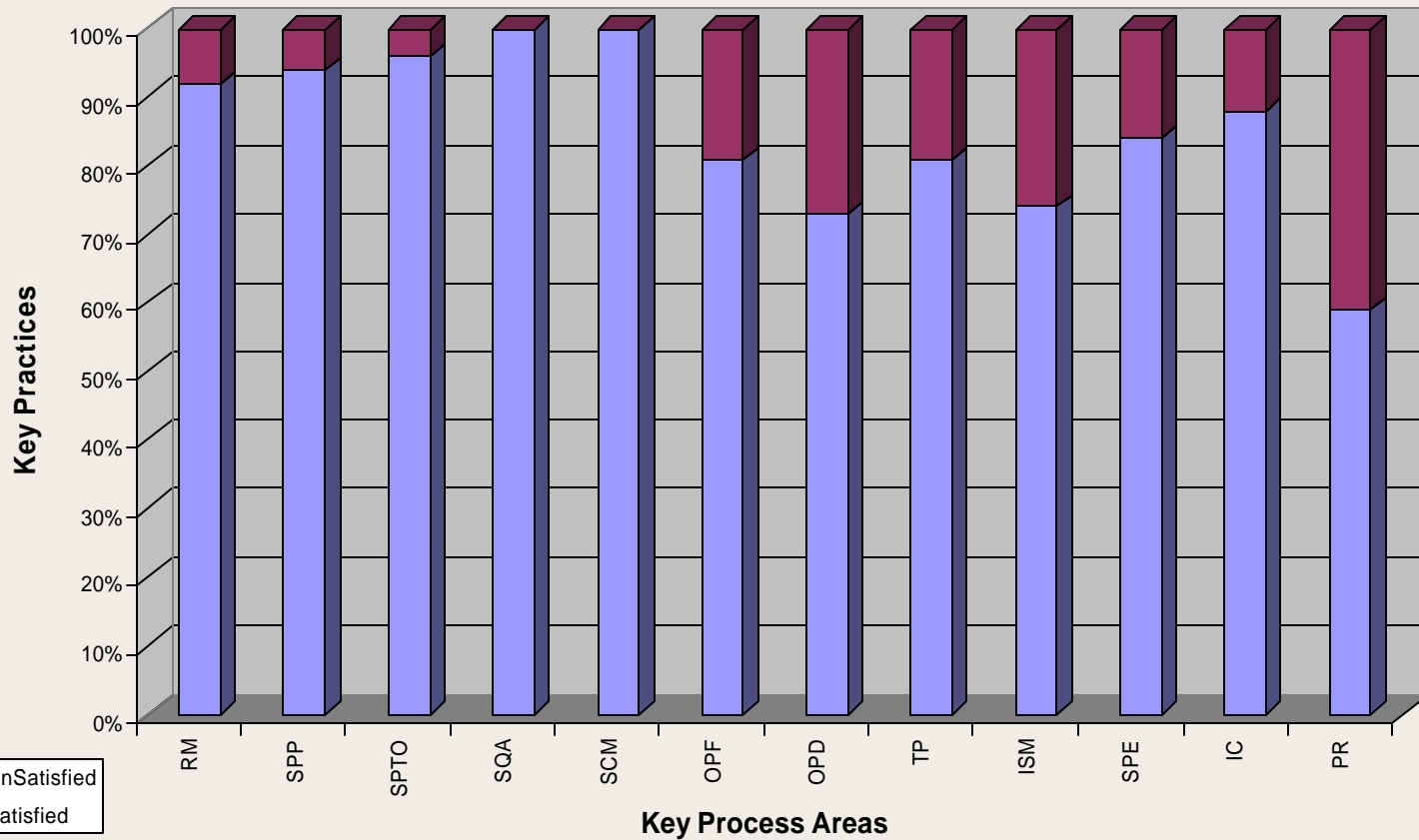


# On Paper: TSP by CMM Level



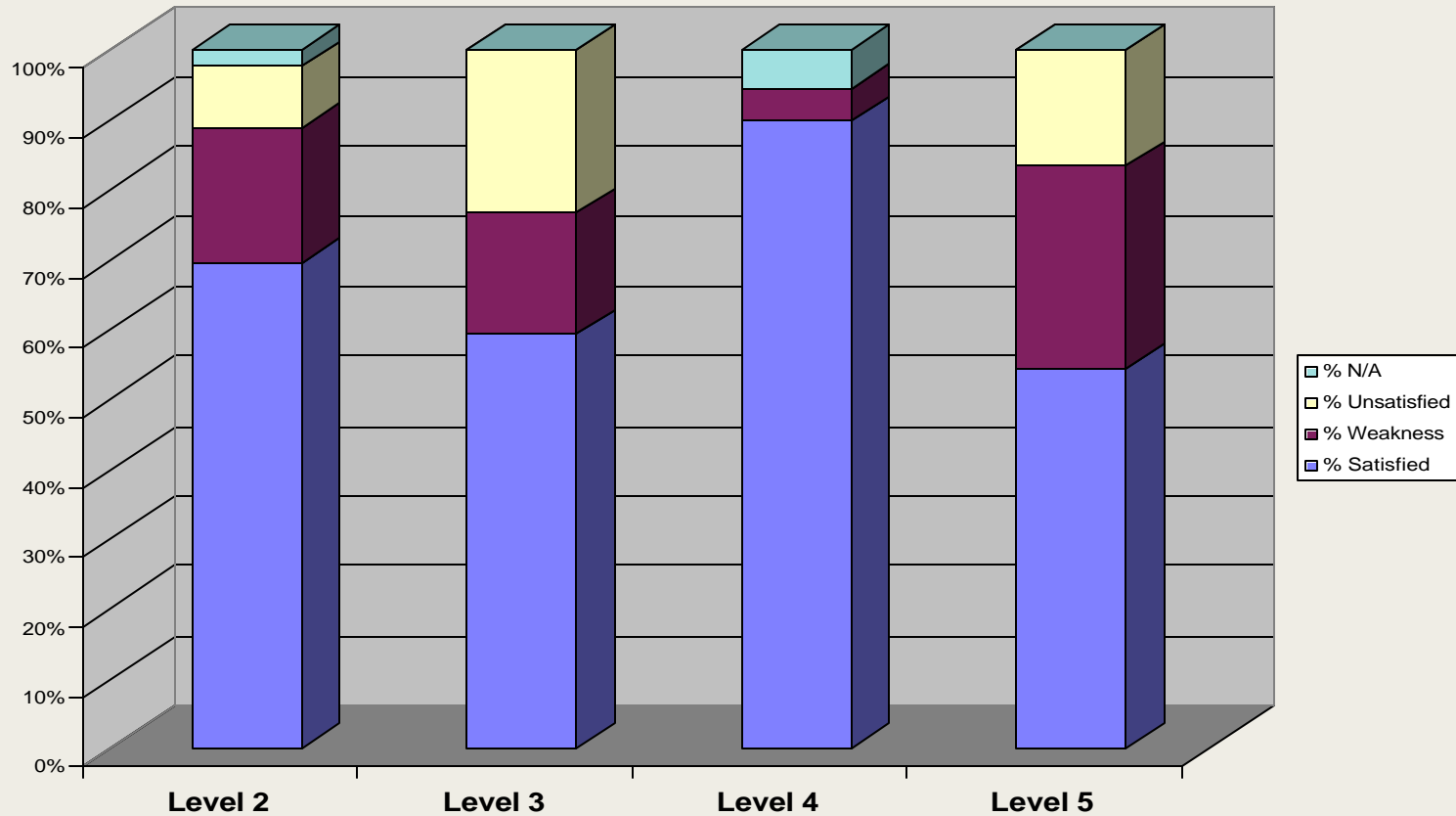


# NAVO Results





# EBS Results





## NAVAIR AV-8B

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Level 2/3 assessment, with observations at levels 4/5

- TSP team was one of three projects
- TSP team showed significant strengths at both levels 2 and 3.
- positive observations at levels 4 and 5 were due largely to the TSP project

AV-8B project teams are integrated teams, including both systems engineers and software engineers.

The AV-8B organization has committed to use TSP on all new projects.



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## **CMM/CMMI Differences at Level 2**

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The major difference at maturity level 2 is the addition of a new process area, Measurement and Analysis.

The specific goals of this process area are

- Align measurement and analysis activities
- Provide measurement results



## PSP, TSP and M&A

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Measurement and analysis of personal data are taught explicitly in PSP training.

TSP team members collect personal data (size, time and defects, as applicable) on their assigned tasks.

Collecting, combining, sharing, and analyzing data at the team level is the essence of weekly TSP tracking.

TSP teams collect and analyze data consistently because they know what to collect, how to do it, and why they are doing it.



## CMM/CMMI Differences at Level 3

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At level 3, the picture is more complex.

- Five engineering process areas that map to two CMM KPAs (S/W Product Engineering, Peer Reviews)
  - Requirements Development
  - Technical Solution
  - Product Integration
  - Verification
  - Validation
- Two new process areas
  - Risk Management
  - Decision Analysis and Resolution
- One CMM KPA (Intergroup Coordination) eliminated (subsumed into other PAs)



# Engineering PAs and TSP -1

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TSP requires that an engineering team either use or modify existing processes, or create new processes that it will follow.

Most teams use existing organizational processes either as-is or as a basis for a more detailed process definitions.

The TSP team in a CMM organization has more and better organizational assets to utilize in their own work.

The new engineering PAs essentially reflect how TSP teams and strong CMM level 3 organizations already operate.



## Engineering PAs and TSP -2

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For example

- A one-page memo defined a three-step organizational process to elicit and validate business requirements.
- A formal three-page, eight-step requirements process was developed for team planning and tracking purposes.
- Individual analysts broke several of the steps down further in order to plan and perform their own work.

On TSP teams, this kind of detailed breakdown from the formal to the informal is common throughout the project life cycle.



# Risk Management

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Risk management is an integral part of TSP planning and tracking.

As with most PAs, there are still specific practices which must be performed outside the TSP team.

The forthcoming CMMI-TSP gap analysis will identify these practices.



# Decision Analysis and Resolution

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This process area is not addressed by any existing TSP process.

However the issue of “deciding how to decide” is rarely seen at the team level on a TSP team.

Because the team is following a defined process and gathering detailed data, most situations requiring a decision are either handled informally by the team, or raised fairly quickly to management.

In practice, at least in an organization using TSP, this area should be almost wholly a management issue.



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# TSP: Not “Just” About Software

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The PSP teaches quantitative process principles in a software development context.

The TSP requires that project teams collectively take control of their engineering processes in order to do the job right the first time.

TSP teams very often include members who are not software engineers.

- Systems engineers
- Hardware engineers
- Test engineers
- Business analysts
- Documentation specialists
- SEPG/SQA



# Personal Processes for All

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To address the reality that most of our TSP teams included non-software engineers, SEI developed a two-day course, “An Introduction to Personal Process.”

It does *not* replace the 10-day “PSP for Engineers” course.

- Software engineers seem to need a lot of convincing.
- Software engineers often have to coach their non-software counterparts.

Although some non-software personnel still have difficulty adapting to disciplined methods, we find many that take to it naturally.



# Future Directions for the TSP

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## CMMI-TSP gap analysis

TSP versions are currently being planned or piloted to extend the reach of the formal process to

- large, multiple-team projects
- groups of small one- and two-person projects
- early acquisition and program initiation phases

SEI customers have used TSP principles to launch and run

- SEPG/EPG
- SQA activities
- product deployment



# TSP Alone is Not Enough

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TSP by itself, even if used by every development team, does not cover all practices of *any* level or process area of CMM or CMMI.

Management support and organizational efforts are essential to introduce, maintain, and enhance these capabilities.

All of the CMMs have a word for this: *institutionalization*.

Institutionalization typically results from strong sponsorship by senior management and strong leadership from an EPG/SEPG or an affected manager.



## Conclusion

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TSP has firm roots in CMM, as does CMMI.

TSP already addresses many of the differences between CMM and CMMI at levels 2 and 3.

Many TSP teams are integrated engineering teams.

TSP should be a good way to transition the CMM practices that you already understand into your broader organization and the CMMI future.



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## **For More Information**

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[jdm@sei.cmu.edu](mailto:jdm@sei.cmu.edu)

### SEI web sites / PSP & TSP Technical Reports

<http://www.sei.cmu.edu/psp/>

CMU/SEI-2000-TR-015

<http://www.sei.cmu.edu/tsp/>

CMU/SEI-2000-TR-022/023

### Contact a PSP transition partner

<http://www.sei.cmu.edu/collaborating/partners/trans.part.psp.html>

### Contact SEI customer relations

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Phone, voice mail, and on-demand FAX: 412/268-5800

E-mail: [customer-relations@sei.cmu.edu](mailto:customer-relations@sei.cmu.edu)



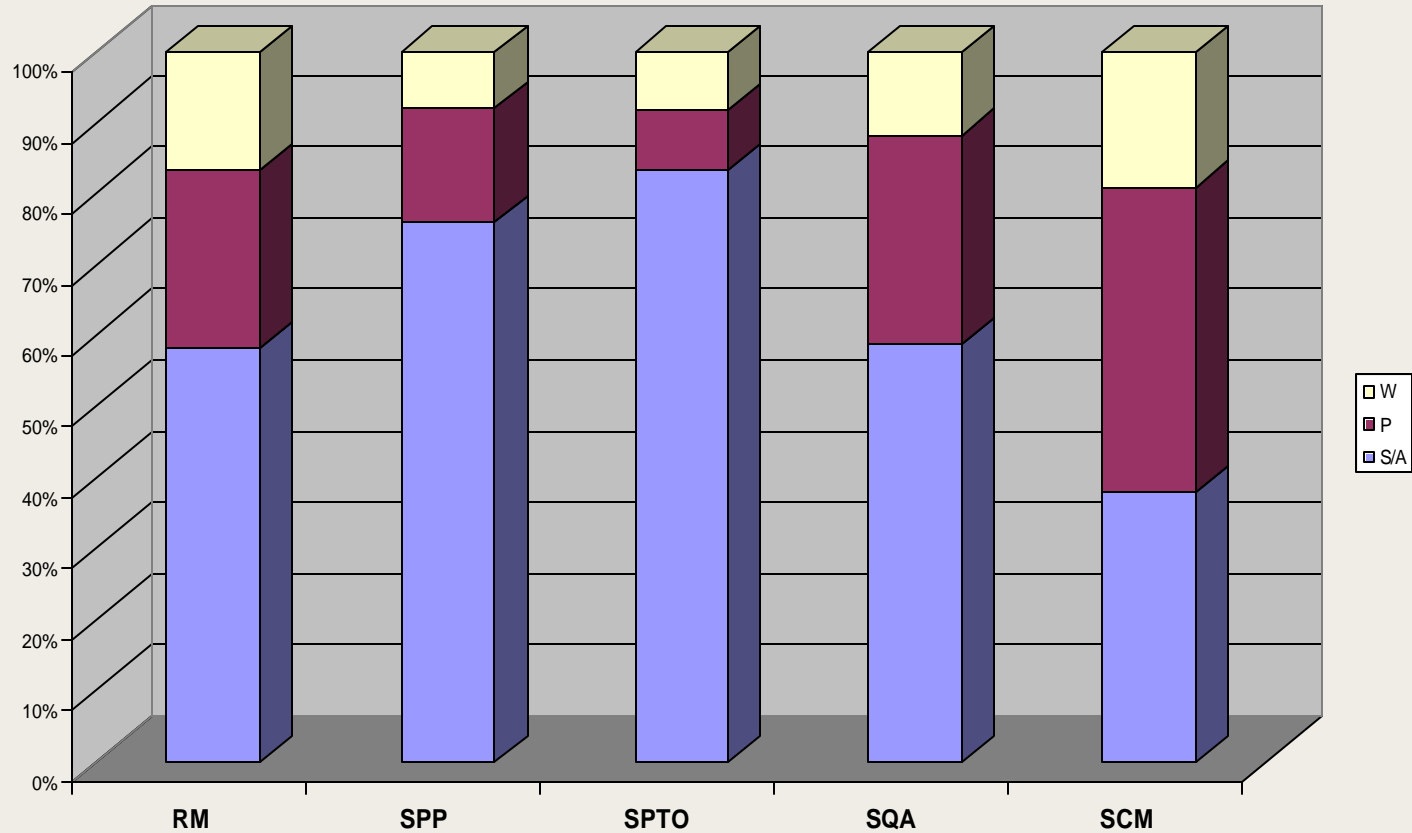
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# **Backup Information**

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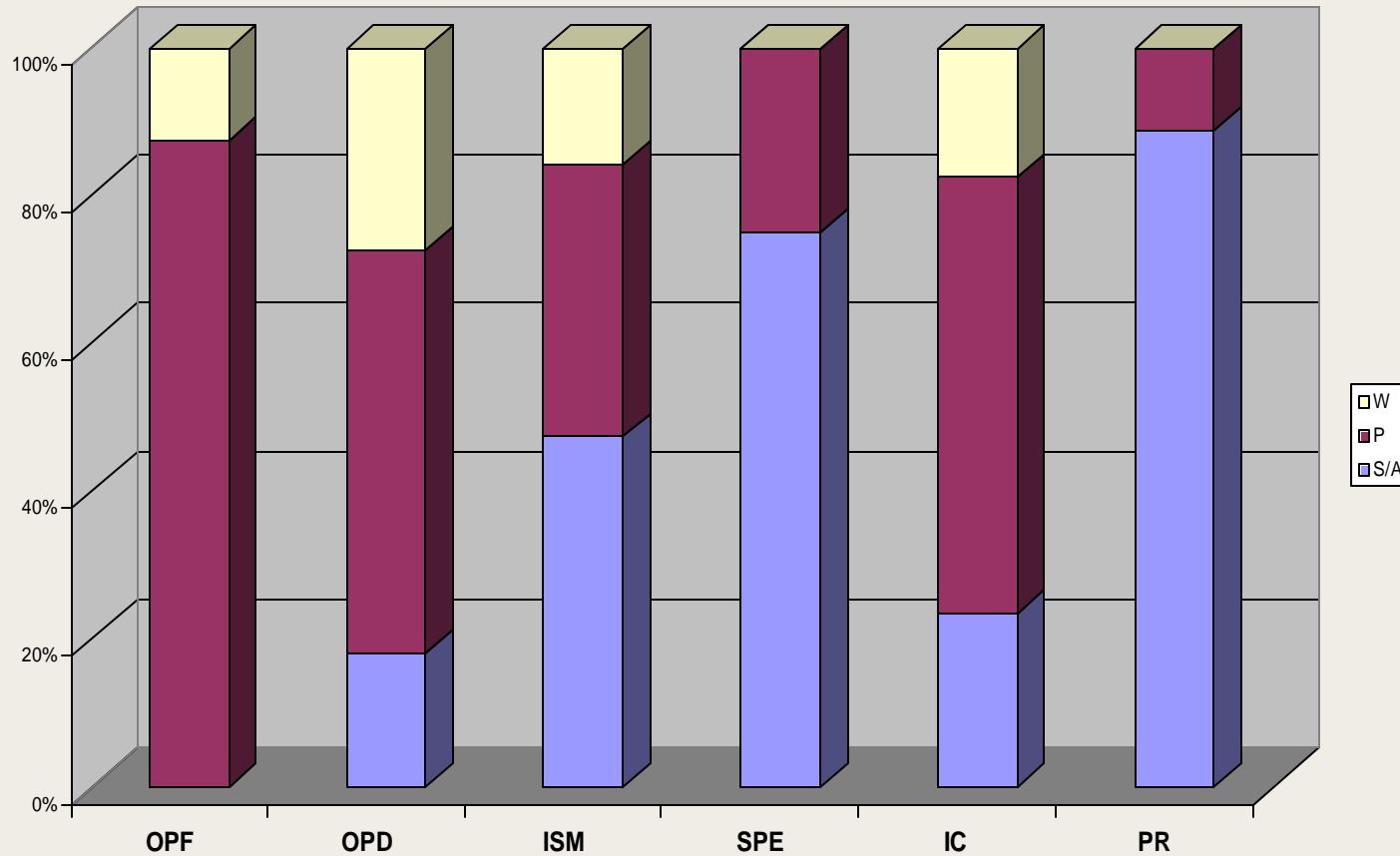
## TSP at CMM Level 2





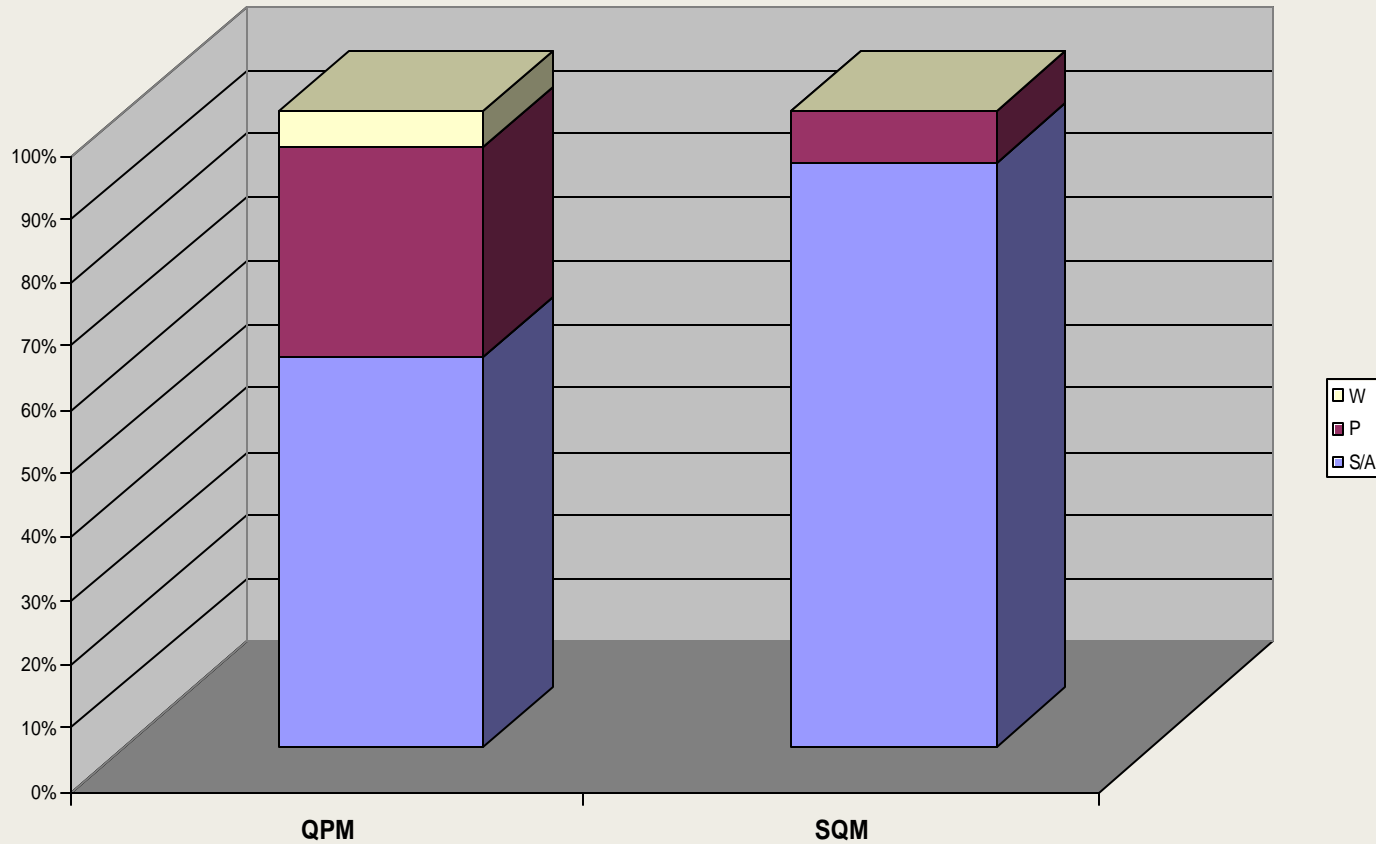


# TSP at CMM Level 3





# TSP at CMM Level 4





# TSP at CMM Level 5

